SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1112.—Vol. XXVI.] LONDON, SATURDAY, DECEMBER 13, 1856. [GRATIS.

PRACTICAL MINING—"TYEING" MACHINERY.

BY EVAN HOPKINS, C.E., F.G.S.

The process of concentrating stamped minerals in long troughs, by means of running streams of water, is called in Cornwall "tyeing." This process is usually done by manual labour, as shown by the sketch, fig. A.

The troughs are about 10 to 12 ft. long, 20 in. wide, and about 18 inches deep; at the head is an iron plate, over which the water is allowed to flow in an even and uniform sheet, falls to the bottom, and runs down the incline plane formed by the bottom of the trough. A boy takes a shovelful of the stamped mineral, which is placed in a heap opposite to him, and rubs it to and fro against the iron plate, and thus the water carries it down in a diluted state, spreads it evenly on the bottom, leaving the richer or heavier particles at the head, and taking the poorer portion towards the bottom of the trough. This mode of concentrating minerals is commonly employed in the tin mines of Cornwall, and was the mode formerly applied to concentrate the auriferous pyrites at Marmato, before the improved process, with blankets, &c., was introduced.

In consequence of the impossibility of making the native boys attend properly to their work, to adjust the quantity of water and mineral so as to ensure a uniform and perfect degree of concentration at all times, I suggested the propriety, in 1834, of doing all this work by machinery on one floor, placed below the stamping-mills.

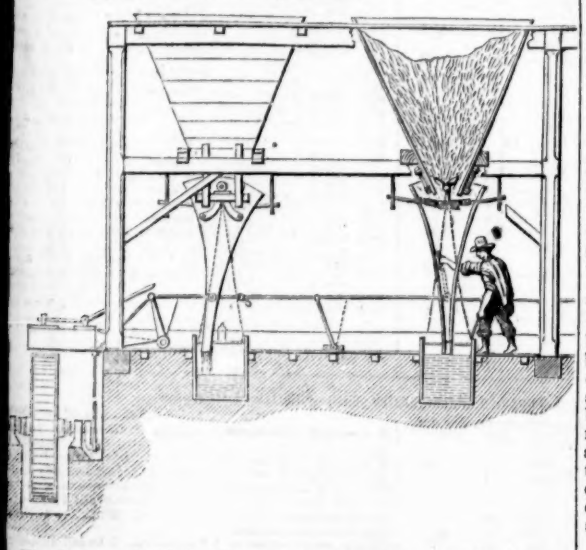

Fig. B shows the kind of "tyeing" machinery I invented for this purpose, which was erected and put to work in the early part of 1836. It was applied to 12 "tyes," and received all the ore from about 60 heads of stamps, which at that time were stamping nearly 2000 tons of rough ore per month. It will be observed, on reference to fig. B, that, above the head of each "tye," or trough, is placed a large hopper, to receive the stamped mineral from the stamps' pits. At the bottom of this hopper is a piece of wood, placed across, as shown in the section on the right of fig. B. Below the hopper is suspended a wooden pipe, on centres, which pipe is made to oscillate like a pendulum, by means of a horizontal rod, worked by a small water-wheel. At the bottom of this pendulum wooden pipe is fixed a piece of sheet-iron, to act like the shovel against the iron plate in the trough.

The feeding action is as follows:—The mineral in the hopper is kept disturbed by the spindle and cutters of the pendulum centre. The mineral is thus kept constantly resting (on both sides of the cross-piece of wood fixed to the hopper) on the board at the mouth of the pendulum pipe, which moves backwards and forwards immediately under the cross-piece and the mouth of the hopper. When the pipe is drawn to the right, the ore is pushed over the edge of the board on the left by the cross-piece fixed to the hopper. Again, when the pipe is drawn to the left, the ore is pushed over the edge of the board on the right, and so on. When once properly adjusted, the ore falls in a regular continuous stream right and left down to the shovel mouth against the iron plate. The whole arrangement is exceedingly simple, and the "tyeing" operation is done much better and quicker than it can be done by manual labour.

The following extracts will show how much this machinery was appreciated, not only during the first month it was in operation, but also in the following year:—

Marmato, March 22, 1836.—"Tyeing" machinery. Yesterday it was so far completed as to enable a trial of it to be made, and although the machinery is in an unfinished state, it was proved sufficiently to leave no doubt of its answering most perfectly. The two English dressers were present, and admitted that neither of them, nor any one employed on the floors, could perform the work with the same degree of perfection. Mr. Hopkins has devoted much of his time and attention to bring it to its present state, and I fully believe his zealous efforts will be crowned with success.

George Williamson, Superintendent.

Marmato, April 12, 1836.—The "tyeing" machinery, invented by Mr. Hopkins is far superior in its operation to manual labour, this has been now practically proved. It will in future supersede the labour of the "tyeing" boys, &c.

George Williamson, Superintendent.

Marmato, Jan., 1837.—The dressing is now carried on entirely in the new floors, and the mineral stamped by the mills is thrown into the hoppers, and undergoes the first concentration by means of the "tyeing" machinery. We now find one English dresser sufficient for the whole, and for the present we have discharged 17 boys, but I anticipate that we may still diminish the number of boys at present employed.

Marmato, Feb., 1837.—The dressing machinery is working to everybody's satisfaction.—L. Degenhardt, Reduction Officer.

The machinery continued to work in the same satisfactory manner until 1839, when, in consequence of the falling off in the Salto lode, and the changes in the management, the whole establishment, stamping-mills, arrastres, and dressing machinery, were allowed to go to ruin, for the want of proper attention, and other unfortunate circumstances, common to foreign affairs carried on by public companies, which need not be noticed here.

MINES AND MINING—THIRD SERIES.—No. II.

BY EVAN HOPKINS, C.E., F.G.S.

Besides the numerous evils complained of regarding the mode in which mining companies are got up and mis-managed by speculators, many promising mineral properties have also been rendered ruinous by incompetent mine agents. It is too commonly supposed that any mine agent who has been long employed in one of the mines in Cornwall or Devon, must of necessity, not only be competent to carry on the operations in any other similar mines, but likewise capable of giving a correct opinion of the value and true character of a metalliferous formation with which he had hitherto been totally unacquainted. This is quite a mistaken notion, and should be most carefully guarded against. Many Cornish miners, known as very valuable men, locally, in Cornwall and Devon, but who had been only acquainted with minerals in lodes, and consequently labouring under the impression that minerals *must* be always found in regular lodes, and in no other conditions, have brought numerous valuable properties to a very unprofitable issue, not alone in foreign countries, but in Ireland, and other parts of the United Kingdom. I could mention several instances in the metalliferous limestone of Ireland, the North of England, North Wales, and in the limestone and slate formation of Prussia, where good mines have been stopped and condemned in consequence of heavy outlays in deep sinkings, steam-engines, buildings, &c., made at starting by agents who fancied that all the minerals must be found below in regular lodes, and that all which they had to do was to sink at a given point as long as they were allowed to do so. These mistakes have also been committed at the Cape of Good Hope, South Australia, Chili, and in the United States. This shows the necessity in commencing to explore new mineral ground that the managing agent should be as a *sine qua non*, not only a good practical miner of experience, but also a man thoroughly acquainted with the general character of that special formation in which he is called upon to give his opinion, and be thus able to arrange the projected exploring works judiciously and economically, so as to give a chance of profitable results.

The lead districts of the West of Ireland are now offered to capitalists on liberal conditions, provided they be taken and wrought by legitimate parties and practical men. These lead districts are more or less within the limits of the limestone formation, where the mineral is found to predominate in irregular masses, and not in uniform lodes; therefore, very great care must be taken in ascertaining the true nature of the metalliferous deposits in these localities in each grant before commencing any expensive sinking. There appears to be a growing disposition to make further trials in Ireland, and there can be no doubt whatever, but that within such a large area of unexplored mineral ground many good profitable mines will be discovered. But, in order to do this effectively, and with the probability of its leading to permanent profitable results, I would recommend that, in the event of a company being formed for such an object, not to undertake it with a small capital. The whole of the best grants should be selected, carefully surveyed by men thoroughly acquainted with the business, and then it should be determined on what setts works should be carried on; estimates should be prepared of the outlay required to make an effectual trial in each, and in the first instance sufficient capital should be obtained to do the same. This being done, the company will be able to form its own judgment of the prospects before them; if good, make a call and proceed; if not, wind-up, with the conviction that fair and judicious trials had been made with the first deposit, and the question finally decided to the satisfaction of all parties. This has never been done yet, excepting in those mines which have been profitably wrought for years by a few of the respectable companies in Ireland.

Geological Survey—The Isle of Wight.—One of the last labours of the late Prof. Edward Forbes was a sketch of the tertiary fluvio-marine formations of the Isle of Wight. During the course of his researches he detected the existence of the fossiliferous strata near Osborne, which have proved to be the equivalents of certain deposits in the Paris Basin. Previous to the completion of his work his demise unfortunately took place, and the record of his researches has been brought out under the supervision of his executor, Mr. Robert Godwin-Austen, assisted by Profs. Ramsay and Morris, and Messrs. Bristow and Salter. The present section comprises a description of the fresh-water and fluvio-marine tertiaries of the Isle of Wight, and a comparison of them with their probable foreign equivalents. The gravel of Freshwater Gate with elephants' remains, the Hazel-nut sands and peaty beds beneath the gravel beds of the south and west coast, the subaerial and lacustrine superficial beds of Tollands Bay, and the brick-earth of Wooton Creek, are all lucidly described, and their various geological characteristics ably delineated. An analysis of previous papers on the Isle of Wight district is likewise given, comprising the opinions of Mr. Webster, Prof. Sedgwick, MM. Dumont and Hébert, and Mr. Prestwich. The fossils belonging to the different series are carefully illustrated, the plates being ably lithographed, and accompanying the work are well-executed coloured copperplate engravings of a geological map of the Isle of Wight, with horizontal and vertical sections. The notes are very copious and explanatory, and the economic productions of the Isle of Wight are detailed. Pure white glass-house sand is obtained from Headon sands, near Alum Bay. Mr. Squire, who has rented the cliffs for several years, states that in the six years between 1850 and 1855 there were shipped 21,984 tons from Yarmouth, principally to London and Bristol. The clay ironstone, which is found in large quantities lying loose upon the shore at the foot of the cliffs between Yarmouth and Hempstead, is collected on the beach, and sent to Swansea, where it is smelted into iron. Cement stones are obtained to a small extent from Alum Bay, and from the quarries of Brinstead. Building stones, of the Limnæan limestone, are extracted. Sandstone is used to a smaller extent. Some of the beds of the lower chalk are so dense as to ring under a blow of the hammer, and are hard enough for building purposes, if sufficiently protected from the weather. A portion of the inner walls of Brixton Church has been built of chalk. In Alum Bay there is only a small bed of pipeclay now remaining; between that and Freshwater Gate traces of the old workings are visible. At Newport, coarse pottery is manufactured from the red plastic clays. Bricks are made from the clays of nearly all the tertiary strata. At Ninham, the loam overlying the flint gravel is converted into them, and north of Arreton Downs, the brick-earth is derived from a red-mottled loamy clay, containing a few small flints, and much resembling plastic clay, except that it is of a lighter colour. The Bembridge marls are converted into bricks and tiles. Near Ningwood, between Claybrook and Heathfield, and at Little Apley, near Ryde, the red and green clays of the Osborne beds are used. At Gunvelle, near Newport, Boston, clay is made into bricks, and tiles are produced in the vicinity. Alum was formerly manufactured from the clays of Alum Bay, and as early as 1579 at works at Parkhurst Forest. Salt is got at Salterns, near Newtown, by the evaporation of the sea-water, first by exposing it in shallow pits to the influence of the sun and wind, and then boiling the strong brine till salt is formed. Agates, and other small stones fit for polishing, are collected on the beach near Sandown, and flint pebbles have been derived from the chalk. The Treatise is a valuable contribution to the science of natural history, and it is a matter of deep regret that the author's early decease prevented him from pursuing his useful and honourable career.

THE SEPARATION OF ANTIMONY AND ARSENIC FROM COPPER ORES.

Messrs. Beudant and Benoit, of Paris, have just specified their patent for improvements in treating ores of copper containing arsenic and antimony.

The treatment of copper ores may be reduced to the treatment of a coarse metal or matt containing sulphur, iron, copper, antimony, and arsenic, in variable proportions, and sometimes other metals, such as silver and gold. The ordinary treatment of ores containing arsenic and antimony consists in driving off or volatilising the arsenic and antimony by successive roastings in presence of pyritous materials. This operation is repeated several times, and the materials are melted after each roasting; the antimony and arsenic are thus at last driven off.

By this invention the copper is separated from the antimony and arsenic, and the antimony, and a large portion of the arsenic, obtained in the metallic state, and nearly pure, by a precipitation effected in the melted matt, and the remainder of the arsenic volatilised during the operation. This result is obtained by certain operations or modes of treatment, which may be employed together or separately.

First Treatment.—Into the melted matt a quantity of metallic iron is introduced, either wrought or cast, which precipitates nearly all the antimony and arsenic, in combination with a quantity of iron and copper, varying with the temperature and the state of the matt. A small quantity of antimony and arsenic generally remains in the matt, which is precipitated by adding about 1 or 2 per cent., more or less, of lead or galena, and continuing the action of the iron. The matt is thus almost entirely deprived of antimony and arsenic. A small quantity of antimony and a considerable proportion of arsenic are volatilised during the operation. If the matt contain a large quantity of sulphur, some roasted ore is added, in order to diminish the quantity of iron required for the precipitation. The antimony and arsenic thus obtained are melted with a mixture of ore and iron pyrites. The copper and iron are thus dissolved, and the antimony and arsenic are left nearly pure, while the cupreous matt is treated again in a subsequent operation.

Second Treatment.—Lime or roasted ore, or a mixture of the two, is added to the melted matt, and the surface covered with charcoal or carbonaceous matter, and thus a metallic button or mass of antimony and arsenic, either pure or mixed with iron and copper, is obtained, in quantity varying with the degree of sulphuration of the matt and the quantity of lime and roasted ore employed. As in the first mode of treatment, a variable proportion of arsenic is volatilised, while the rest remains with the antimony; the action is completed by the addition of a small quantity of lead or galena, assisted by the action of metallic iron, or by the action of the charcoal on the surface. The remainder of the antimony, and a portion of the lead, are thus precipitated. As an example of this mode of treatment, it may be mentioned that a grey copper or coarse metal, consisting of 60 parts by weight of proto-sulphuret of iron, 20 parts of sulphuret of copper, and 20 parts of sulphuret of antimony was melted, with the addition of a mixture of 16 parts of lime and 6 parts of roasted ore. A button of antimony weighing 13 parts was obtained, and the operation was completed by the addition of 2 parts of galena, and stirring the mixture with a piece of iron.

Third Treatment.—To the melted matt a sufficient quantity of roasted ore is added, to saturate the excess of sulphur and metallic lead which precipitates the antimony and arsenic, which carry with them a quantity of lead, varying with the time allowed to elapse after the addition of the lead, the state of sulphuration of the matt, and the quantity of lead added. The operation may be so conducted as to obtain a complete precipitation of the antimony without its carrying with it more than a very small quantity of lead. In lieu of employing metallic lead, galena may be added to the matt, together with roasted ore or lime, or both, and the whole is then covered with charcoal or carbonaceous matter. The antimony and arsenic are thus precipitated. The button, or lump of antimony and arsenic, contains a certain quantity of lead, copper, and iron.

By these modes of treatment, the antimony and arsenic are removed in the metallic state by precipitation, and by volatilising a portion of the arsenic, matts, derived of antimony and arsenic, are obtained, and which the copper may be extracted, in the same manner as from the matts obtained from the purest ores, which are free from antimony and arsenic, whose presence is so injurious to the quality of the copper. Besides obtaining purified matts, the inventors obtain, as accessory products, firstly, a mixture of antimony and arsenic nearly pure, or containing a little lead; and, secondly, a mixture of antimony and arsenic, containing copper and iron, which have been carried down in the precipitation. To separate the copper carried down in the second case, the cupreous antimony is melted with a mixture of pyrites and ore in small quantity; the iron and copper thus become sulphuretted, and pass into the matt, while the antimony and arsenic remain at the bottom nearly pure. The matt thus produced carries away a little antimony and arsenic; it is treated like the matts which are to be purified and mixed with them. In these processes, the gold and silver, if present, are concentrated in the antimony and arsenic, from which they are separated by any of the known means.

The different modes of treatment mentioned, are applied in nearly the same manner, and in the same or similar furnaces; it will, therefore, suffice to describe one series of operations more in detail. A great variety of furnaces may be employed, provided they have an internal cavity in which the antimony may collect.

The matt is melted on the bed of a reverberatory-furnace, and the workman judges from its colour whether it contains sufficient sulphur to saturate the different elements, and convert them into proto-sulphurets, and if it does not appear to contain sufficient sulphur, a portion of pyritous ore is added. The colour of the matt is a very correct test or indication to the eye of the workman after a little practice. When the matt is well fused, a mixture of lime and roasted ore is added, in the proportion of about 80 parts of lime and 30 parts of roasted ore for each 100 parts of sulphuret of antimony contained in the mass. The proportions admit of considerable variation, and the preceding are only mentioned as having been found to produce a good result, After the whole mass, with these additions, is completely fused, some charcoal, or other carbonaceous material, is placed on the surface, and the heat continued; the antimony and arsenic collect in the cavity in the bed, from which they are tapped or run out; about 2 per cent. of galena is then added to the remaining matt, and it is stirred with an iron tool. A fresh portion of antimony, containing some lead, collects in the cavity, and is tapped and run out; the matt is then also run out of the furnace. If the last portion of antimony has carried down a little lead with it, the matt may be considered to be pure; but if the antimony does not contain any lead, a small portion of lead should be added to the matt before running it out of the furnace.

By these means, which are simple and easily understood by the workman, the matt is purified, by a single fusion, from the antimony and arsenic

which it contains. The matt may then be treated like those now obtained from pure minerals, by submitting it to a roasting and fusion.

The treatment described is applicable both to the rich matts and the matts of the first fusion, so that if the first treatment should not have entirely removed the antimony and arsenic, owing to negligence on the part of the workman, or any other cause, the rich matt may be purified from the last portions of antimony and arsenic by again treating it by one of the modes hereinbefore described, as for example, by means of a piece of iron; by this means not only the remaining antimony but also the lead is separated. The more or less red colour of the piece of iron employed in the process, shows whether the copper is free from antimony. The antimony thus separated contains copper, and may be melted and passed through the processes with the matts of the first fusion. The purified matt is reduced by the ordinary means, and furnishes a very pure copper.

The inventors claim the mode or modes of separating antimony and arsenic from copper ores by precipitating the antimony and arsenic in the metallic state, as described.

MINING AND IRONWORKING IN PRUSSIA.—No. III.

[FROM OUR OWN CORRESPONDENT.]

Oberhausen, mentioned in my last, is made, by the opening of the line from Rotterdam, *via* Amsterdam and Utrecht, to Oberhausen, which took place in October, the junction station of this Dutch-German Railway and the Great Cologne, Düsseldorf, Dortmund, Berlin line, enjoying thereby an enormous traffic; it is also the key to the important mineral districts of the Rhine province of Westphalia, being situate in the middle of the northern boundaries of these provinces. You reach Oberhausen from Rotterdam in about six hours, and although hitherto, *via* Dover and Calais or Ostend, Brussels and Aix-la-Chapelle was the swiftest route, henceforth *via* Rotterdam will be the great route from London to Germany, and the projected Oberhausen, Mülheim, Essen, Bochum, Witten, Dortmund line is the direct continuation of the Dutch Railway into the middle of the Westphalia mining district. This line will form a branch of the Cologne Berlin line, rejoining it at the Dortmund station, and will also communicate, by a branch line to Witten, with the Dortmund, Witten, Hagen, Eberfeld, Düsseldorf Railway, again joining the Berlin, Cologne line, and running into Hagen, Siegen line at Hagen.

The Rhine, also, with its numerous sailing vessels and fine steamers, presents the best shipping communication and accommodation between Rotterdam and Ruhr Ort, and the south of Germany; and from Ruhr Ort, which is situate close to Oberhausen, and connected by a branch railway thereto, by the navigable river Ruhr upwards to Witten, on the Ruhr, on both sides of this river are a great number of coal pits and ironworks. It will, therefore, be seen that the Cologne, Düsseldorf, Oberhausen, Dortmund Berlin Railway on the north, and the Dortmund, Witten, Hagen, Eberfeld, Düsseldorf Railway on the south, form together a circle round the greater part of the Westphalia coal district, whilst the Oberhausen, Witten, Dortmund Railway, and the navigable river Ruhr, cross the middle of that mineral country. The importance of this latter railway may be inferred from the petitions to the King, alluded to in my last. The great extent of the coal transport on the river Ruhr from Witten to the harbour of Ruhr Ort, on the Rhine, may be judged by the fact that in 1855 there were shipped 65,044,462 scheffels (or about 2,500,000 English tons) of coal for export from Ruhr Ort, by ship, to Holland and the Upper Rhine. In 1835, only 20,830,676 scheffels were transported on this river. The combination of these double means of transport is calculated to have a decided influence upon the increasing export of coal to Holland, &c., and the Rhine province.

The transport of merchandise on the Cologne and Berlin Railway, combined with the immense coal traffic, is so great, that, although to the north boundary of the Westphalian mining district, two lines of rails are laid the whole distance, there is no further accommodation for the transport of the great masses of the mining products of the district; especially considering the increasing number of its blast-furnaces, forges, rolling mills, &c., so that the project has already fair prospects, as is clearly shown in the *Augsburg Gazette* of this month; and to combine (besides the railway, and the best artificial roads applicable to the transport of raw materials), there the navigable river Weser, by a canal with the Rhine. We should be happy to show your esteemed readers this highly-flourishing Westphalia mining world, with all its existing and projected coal and ironworks, railways, roads, rivers, &c., and its blast-furnaces rising up in all directions, and I think even an Englishman would be very much astonished.

But here we would raise the question why—as by practical scientific mining there was nothing at all for English capitalists to do in California, Australia, &c., but to lose their money in gold mining, so long as diggers could do miners' surface work on their own hands, without control or discipline, and wages and all other necessaries in those countries are too high for success, although, when that state of things has changed, gold mining operations may perhaps be carried on with advantage—the English have neither taken the lead in that greatly advancing mining country Prussia, nor even entered into more extended competition with the Germans themselves, the Belgians, and the French, as there was always a great market in Prussia for English pig-iron, bar iron, plates, and sheets? Why should not the English still command that market, notwithstanding the immense discoveries which have been made of iron and coal within the last few years, by erecting on the spot many blast-furnaces, forge-mills, and rollers, instead of allowing themselves to be ultimately nearly thrown out of the iron trade of Prussia?

The Germans' mining in silver, lead, and copper is unrivalled; but their iron smelting works, and the machinery for mining operations connected therewith, although mining is highly scientifically cultivated, and superior iron and steel is manufactured, are in their infancy, so far as regards carrying on business *en masse*, and at a moderate price, according to English principles and English mining. Has not England the best scientific and practical engineers; practical miners, with the best knowledge of all the machinery, engines, &c., employed in mining; and approved managers, who could erect and conduct gigantic blast-furnaces, and coal and iron works? Has England no men for instructors in these mining operations for foreign countries, where ores, fuel, wages, &c., are cheap, and the men well educated, and capable of being trained in the shortest time to useful and excellent miners, and where the raw product is of double the English market value, on the spot? The fact that few English engineers and English miners are employed in German mining, is out of all consideration, considering the great results already obtained in Prussia from her mineral productions. Why, then, is not Prussia a field for English capital and mining; especially as, in consequence of the immense demand for iron, it is to be feared, as stated by the Berlin Correspondent of the *Times*, on Sept. 11, that public undertakings in Prussia will come to a stand-still for want of iron works; and again, in the *Cologne Gazette*, of Nov. 21, it is stated that the greatest ironworks in Prussia, the Phœnix, has already contracted for the whole of its produce into 1858, among the contracts there being a large quantity of rails for Austria.

But besides this, there must be "something rotten in the state of Denmark," as Hamlet says, since, perhaps, the answer of capitalists will be, and is so, as I hear, we have already lost money enough in our English colonial and foreign mining, and have no more confidence to do anything. But in such a case, I would ask, Have you lost your good money by honest mining and practical miners, or by your own *fraiseurs*, non-professional agents, illegitimate sharedealers, or by your own cousins and relatives, without the slightest knowledge of what is called a mine? Did you know what there was to deal with, or that there was any lode or mine whatever? Have you lost your money by your own worse management, without consulting trustworthy practical engineers, and by your own elected bad board of directors? Or did you lose it by embarking in what was a high and splendid speculation to deal with at first, but from which the promoters intended to retire immediately the shareholders had paid their money, so that business might commence with nothing?

Again, it will be said, and is said, no honest board of directors could now be found at all who would undertake the task of carrying on a foreign mining business in good faith, and founded on sound and honest principles, after so many great delusions. But suppose this be true, although many English colonial and foreign mining companies show contrary facts, it would be double high time to make a breach for renewed honest British-foreign mining, and to endeavour to show what can be done by mining corporations properly conducted, even in London. This is my strong opinion, and, although the task might be a hard one, the object must be gained; and every well-minded Englishman should join to solve this question with honour to the British name. It is with great pleasure that I notice by the *Times'* article that Mr. James Bird, an Englishman, has already formed a joint-stock company at Berlin for manufacturing railway plant, both rolling and permanent, with a capital of 2,000,000 thalers, and that he would stand a fair chance of reaping double advantages. By the enormous demand which has existed of late years for railway appurtenances in Prussia, one work (Borsig's Machinery and Iron-working Establishment) has risen in a few years from comparative nothingness to a point at which it produced, last year, a profit of 300,000 thalers. In Prussia alone there will be 1500 English miles of railway made in the next three years, requiring 600 locomotives, 3000 carriages, and 6000 goods' trucks, besides all the bridges, turn-tables, &c.; and in addition thereto, all the requirements of Russia and Austria will almost of necessity be obtained, or attempted to be obtained, in Berlin. For Austrian railroads alone, there will be required in the next two or three years 6000 locomotives, and only a week or two since an agent was there with an order for 60 at once. With the present means of production in Berlin, no large orders for iron-work can be accepted, with any probability of execution, within twelve months, so that an enterprise that combines ample capital, knowledge of business, scientific skill, and energy of action (and the names of the parties concerned guarantee these qualities), promise to produce something gigantic in the way of profit, seeing the constantly increasing demand for its wares springing up around it. The whole capital has been subscribed without bringing it before the public, and the emergency of the case, as public undertakings must not come to a stand-still in Prussia for want of iron-works, has procured the ready concession of a charter to the originators of the company.

This would be a step in the right direction, if this new (although more mechanical) iron-work had been erected upon indispensable principles, and had had the basis of a truly great and complete iron-working establishment, working with its own coal and ironstone, which raw materials every newly-started establishment should have at its free command. I fear, however, the work at Berlin will not have the necessary and primary products at its disposition to produce every quality and quantity of pig, refined, and steel iron, castings, &c., made by its own blast-furnaces from its own raw products—rails, malleable iron, cast and wrought steel, &c., being made according to the purposes for which they are intended, and thus command every home and foreign competition. On these principles new undertakings could and should now be carried on. The greatest of advantage might be derived by another English company establishing another great ironworks in this country, and introducing the newest inventions and improvements, and working its own blast-furnaces with its own coal and ironstone. It would thus be enabled to supply the existing mechanical and machinery establishments, puddling-works, rollers and forge-mills, foundries, cast-steel makers, and others purchasing their materials, with raw pig and steel iron, in every shape, mixture, and numbers. Also refined grey and refined steel iron, both in lumps, or in a granulated state, and also the heaviest casting pieces, &c., especially as the greatest ironworks in the Rhine Province and Westphalia convert pig-iron of their own manufacture into malleable iron, rails, hoops, &c., by their own forge-mills and rollers, but take no competition in selling their raw products. This is the case with the Hoerde Iron-Works, Phœnix Company, Oberhausen Ironworks, &c. Thus, by erecting blast-furnaces of large size, and selling raw products direct in the market, combined with the advantages of working their own coal and ironstone (which Englishmen well know how to do), there would be comparatively no risk, the least possible trouble, the smallest outlay, and the highest attainable profit. Westphalia possesses all these advantages. The best bituminous coal and ironstone, easily and cheaply worked, of every description, abound in the best situated localities, the district being intersected by a navigable river, superior railways, and the best artificial roads. Coal, ores, limestone, wages and building materials are cheap, and the dense population is composed of spirited, well-educated, hard-working men.

THE CLIFF MINE, LAKE SUPERIOR, UNITED STATES.

[FROM OUR CORRESPONDENT IN AMERICA.]

The existence of native copper in North America was ascertained by the earlier pioneers of civilisation. In various parts of the Continent, from the Northern Lakes to the Gulf of Mexico, the Aborigines, it is said, were observed wearing rude ornaments of that metal. As the American Indian was totally unacquainted with any method of reducing metals from ores, and since no considerable mines of virgin copper have been discovered south of latitude 47°, it is a fair inference that the mines of Lake Superior furnished, for centuries, the materials for the simple jewellery of the native tribes. The narrative of the Jesuit fathers, still existing in the archives of France, relate their discovery, in the latter part of the seventeenth century, of the boulders of copper lying on and near the shores of Lake Superior.

Between the years 1766 and 1768, Jonathan Carver, of Connecticut, explored the borders of the same lake, and describes, in the volume of his travels, the richness of its mineral veins. In 1771, Alexander Henry expended labour and capital in mining on the banks of the Ontonagon River, and in the following year on the north shore of the lake. Unacquainted with the laws of mineral deposits, his attempts at mining were entirely unsuccessful. In 1819, General Cass, late minister from the United States to France, visited the same region, and observed the famous mass of native copper lying on a bank of the west branch of the Ontonagon. This mass weighed more than tons, and was at that time by far the largest ever seen by civilised men. It was afterwards transferred to the National Patent office at Washington. Such a boulder would, at this time, attract but little attention at Lake Superior. Masses of from 30 to 50 tons are often found in the leading mines. The Cliff and Minesota have each produced masses of several hundred tons of nearly pure metal.

Notwithstanding the accumulation of evidence of the abundance of copper in the north-western territory of the United States, so great was the distance of the region from market, and mining in an unsettled country attended with so many hazards, it was not till the publication of the report to the state of Michigan in 1841, of Douglas Houghton, state geologist, that the attention of adventurers, to any considerable extent, was attracted to the enormous mineral wealth of the southern shores of Lake Superior. After the cession to the United States, by the Chippeway tribe of Indians, of a large territory, now known as the mineral region (March 12, 1843), explorations were made by adventurers from the neighbouring territory of Wisconsin.

In 1844, the first mining operations, by an organised body, were commenced by the "Boston and Lake Superior Company," under the direction of Dr. Charles T. Jackson, United States geologist, on veins discovered by C. C. Douglas (the present agent of mines at Portage Lake) and others, but without success. About the same time, Dr. Charles G. Hussey, of Pittsburgh, Pennsylvania, visited the region, and leased, from the Government, a large tract of land in the immediate neighbourhood of that occupied by the Lake Superior Company. Here commences the history of the extraordinary results of the operations of the Pittsburgh and Boston Mining Company.

The first location was made by Dr. Hussey, at Copper Harbour. A "green rock," situated quite near the entrance of the harbour, had long been familiar to the early *voyageurs*, and had given the name to the locality. This rock, the outcrop of a cupriferous vein, was composed of hydrous silicate of copper. Two shafts, of 40 ft. and 60 ft., were sunk on the vein without paying results. Some 1500 ft. further inland, while these shafts were in progress, a discovery was made of boulders of black oxide of copper. This led to an examination of a vein in the same vicinity, which proved to be of black oxide, 15 to 20 inches in width, and yielding 60 to 70 per cent. of pure copper. At the opening of navigation, in the spring of 1845, a force of 30 men, supplied with all the implements and munitions of mining, commenced sinking two shafts. The lode disappeared at the depth of 15 ft.; but the vein being well-defined in its character, the main shaft was sunk 150 ft., and then abandoned. Having expended about 5000*l*., and received for nett proceeds of mineral raised only 600*l*., it was deemed best to explore the tract leased by the company at Eagle River. Here, in Aug., 1845, was discovered the vein known as the Cliff Mine.

Mr. Whitney, in his "Metallic Wealth of the United States" (1854) says:—"This vein was first observed on the summit, and face of a bluff of crystalline trap, rising with a mural front to the height of nearly 200 feet above the valley of Eagle River at its base. The break or depression made by it in the back of the ridge was quite distinct, and has since been traced to the lake, and found marked by ancient excavations. At the summit of the bluff, as I saw it a few days after its discovery, it appeared to be a few inches wide, and contained rave copper and specks of silver, beautifully incrusted with capillary red oxide, with a gangue of prehnite. Half-way down the cliff it had expanded out to a width of over 2 ft., and consisted of numerous branches of lanmonite, with a small percentage of metallic copper, finely disseminated through it. Of course, at this time, nothing whatever was known of the varying character of the lode in different belts of rock, nor had the trap been supposed by the miners to be the principal metalliferous rock. Without knowing anything of the entire change in the character of the rock, which takes place at the base of the cliff, where there was a heavy accumulation of fragments of rock dislodged from above, and suspecting as little as any one else the unprecedented discoveries about to be made in the metalliferous bed beneath, I advised the clearing away, and opening of the vein, at as low a point as possible, because it appeared to widen out and improve in depth. A shaft was sunk a few feet a little below the edge of the bluff, and a level driven into the greenstone a short distance, but nothing was done of importance until the talus at the base of the cliff was cleared away, and the vein traced into the amygdaloid. A level was then driven in upon it, and at a distance of 70 feet the first mass of copper was struck—a discovery of the greatest interest, since it revealed the presence of a metalliferous belt, whose existence had not before been suspected, and showed the extension of the lodes of Lake Superior into belts of rock of different lithological character, and the variations in richness attendant on such transitions. The vein is remarkably regular in its course, which is about north 27° west, and its underlay is about 10° to the east. In the lower levels its dip is more varying; some parts of it expand to 3 or 4 ft. in width, other portions are pinched up to a few inches, but its average width is probably from 15 to 18 in. The veinstone is principally quartz, calc-spar, and the zealitic minerals, and is characterised by an abundance of finely-crystallised minerals, of which drusy quartz is the most common, and found at this mine in finer specimens than anywhere else on the south shore of the lake; it is associated with apophyllite, prehnite, and calc-spar, in various crystalline forms. The metallic contents of the veinstone consist exclusively of copper and silver, both only in the native state."

The company's territory comprises 5383·41 acres, the original cost of which was $11,616·52, or about 2300*l*. Of this tract, 4200 acres are mineral lands. These are traversed by several metalliferous veins, outcropping in many instances on the surface, so far as explored they seem to cut the geological formation of the country at nearly right angles, and are traced from the shore to the extreme southern boundary of the location—nearly three miles. About two-thirds of that distance is highly favourable, geologically to the production of copper. Only one vein, however, has yet been proved. Thus far the workings have been confined to about 1600 ft. in length to the vein, and to the depth of 462 ft. below the adit level, and, to what has been considered a branch lode, but now believed to be parallel, called the west vein.

The progress of the company will be most easily apprehended by an examination of the figures below. In 1845 there were shipped but 16½ tons of copper—in its rough state—the total production of the year. In 1855 the product was 1484 tons, yielding 62·56 per cent. of ingot copper, worth, after deducting cost of smelting, 25·33 cents per pound. The mineral is shipped from the mine—one-half to Pittsburgh and the balance to Cleveland—in the shape of masses, barrel-work, and stamp-stuff. We have not at hand an accurate statement of the purity of each of these classes. Approximately it may be said to be, respectively, 70, 50, and 60 per cent. Over one-half of the whole product is of the first-class.

The company owns extensive smelting works at Pittsburgh, and finds a ready market for the proportion of the metal sent to that city. The copper smelted at Cleveland is consigned to New York. It casually, as is true of all Lake Superior copper, commands from 1 to 2 cents more per pound than that Chili or Great Britain. Its peculiar toughness, and a slight trace of silver, render it very desirable for many manufacturing purposes.

During 12 months ending June 30, 1856, the average number of miners, including copper-cutters and timbermen, employed at the Cliff Mine was 219, earning $37·37 per month; surfacemen, of all descriptions, 226, earning $30·07 per month; cost of drifting, $9·15 per foot; cost of stoping, $41·04 per fm.; cost of sinking shaft in very hard ground, in which 12 men sink only 15 ft. per month, $34·80 per ft. During the same time there were produced, in rough copper, 1,737,133 lbs. in masses; 728,045 lbs. barrel-work; and 699,763 lbs. dressed stamp-stuff; or about 1582 tons. The average yield per fathom of ground broken has been 1294 lbs., of 65 per cent. copper.

The amount of expenditure, stated below, has been mainly cost of mining. The only item of magnitude therein included, exclusive of mining, are cost of the location, between eight and nine square miles, $17,242·54; and smelting-furnaces, ware house, and pier, $41,799·59.

To the receipts should be added the amount of capital stock paid in by shareholders, on 6000 shares, $110,905.

Independent of all the difficulties attending mining in a wilderness, there have been geological embarrassments which have prevented the Cliff Mine from making as rapid progress as the Minesota Mine, in the Ontonagon district. But the peculiarities of the formation at Kewcenaw Point are getting to be better apprehended. Great improvements are now projected, and, with a continuance of the energy, ability, and integrity of the present management, in a few years the Cliff Mine will be second to none in the world.

AMERICAN MINING LAW—LAKE SUPERIOR.

The clearness and simplicity of American Legislative Acts have long been acknowledged, and some of our most valuable Acts of Parliament owe their existence to laws which had been found to work well in the United States. The "Act to Authorise the Formation of Corporations for Mining, Smelting or Manufacturing Iron, Copper, Mineral, Coal, Silver, or other Ores or Minerals, and for other Manufacturing Purposes," is no exception. In its general character and effect, it is not unlike the English Joint-Stock Companies Act, 1856; but, whilst it is much more intelligible, and equally stringent, is contained in about one-twentieth the space occupied by our Act of Parliament. We subjoin a full abstract:—

SECT. 1.—The people of the State of Michigan enact: All companies under the Act shall be capable of sueing and being sued, and may have a common seal, and alter and amend same; may elect necessary officers, fix their compensation and determine their duties, and make by-laws, not inconsistent with the laws of the state, as a majority of stockholders shall direct.

SECT. 2.—Not less than three persons associated, by articles of agreement, for carrying on any mining or manufacturing business complying with the Act, shall, with their successors and assigns, constitute a body politic or corporate in fact and name, under any name assumed by them in their articles of association: provided no two companies shall assume the same name.

SECT. 3.—Before any corporation under this Act commence business, the president and directors shall cause their articles of association to be filed with the Secretary of State of this State, and the county clerk of each county in which said corporation is carrying on business, said articles to be recorded in said office at length, in books prepared for that purpose, at expense of said corporation.

SECT. 4.—The articles of every such association shall be signed by those first associating, and acknowledged before some person authorised by the State to take acknowledgements of deeds, and shall state the objects of the company; capital stock and number of shares; amount paid up; names and residences of shareholders, and the number of shares held by each; the place where the business office of corporation is located, and county or counties where business is carried on; and the term of its existence—not to exceed 30 years.

SECT. 5.—Every such corporation shall make a report, signed by the majority of the board of directors, containing—Amount of capital paid up; amount invested in real estate; ditto in personal estate; amount of debts and credits, as near as may be; name of each stockholder, and number of shares held by him at date of report. Every report shall be verified on oath by the officers signing same; and if any person shall, as to any material facts, knowingly swear or affirm falsely, he shall be deemed guilty of perjury, and punished accordingly.

SECT. 6.—The capital stock shall be fixed and limited in the articles of association, not less than $10,000, nor more than $500,000, and shall be divided into shares of $25. The capital stock and number of shares may be increased at any meeting of stockholders called for that purpose: provided, that the above limit be not exceeded.

SECT. 7.—It shall not be lawful for said corporation to appropriate its funds to any other purpose than that named in the articles of association.

SECT. 8.—Any two of those associated may appoint a time and place, and call the first meeting by 15 days' notice, by public advertisement.

SECT. 9.—The stock, property, and affairs of corporation, shall be managed by not less than three nor more than nine directors, as determined by articles, one of whom shall be resident in this State. They shall hold office for one year, and until their successors shall be duly chosen.

SECT. 10.—The directors of every such corporation shall choose one of their number president, and such other officers as their articles of association and by-laws may require, who shall hold their offices one year, or until the majority of stockholders choose others in their stead. The directors shall have power to fill vacancies by death, &c., for the current year.

SECT. 11.—The directors may call in the subscription by instalments, by notice in accordance with by-laws. The stock of any shareholder neglecting or refusing to pay within 60 days, and after he shall have been notified thereof, may be sold by the directors at public auction, at the office of the secretary of the corporation, giving at least 30 days, in some newspaper published in the same county, or in the city of Detroit; after payment of instalment and expenses, the balance to be refunded to stockholder. The purchaser to enjoy all the rights of a stockholder to the extent of the shares so bought.

SECT. 12.—A majority of directors, convened according to the by-laws, shall constitute a quorum for the transaction of business, and those holding a majority of stock at any meeting of stockholders shall be capable of transacting the business of the meeting. Each share shall be entitled to one vote, which may be given in person or by proxy filed.

SECT. 13.—The non-election of directors at the annual meeting shall not cause the dissolution of the company; but the election may be held at any time after, by giving 30 days' notice, as provided by Sect. 11.

SECT. 14.—The books of corporation shall at all reasonable times be open for the inspection of any of the stockholders, and once in each year a statement of accounts shall be made by order of the directors, and laid before the shareholders.

SECT. 15.—Every such corporation shall have power to hold such real and personal estate as shall be necessary for the purposes of the company; the real estate not to exceed 3000 acres.

SECT. 16.—The stock of every corporation shall be deemed personal property, and shall be transferred only on the books of such company; and such corporations shall at all times have a lien upon the stock or property of its members invested therein for all the debts due from them to said corporation, which may be enforced by advertisement and sale, as provided for selling delinquent stock, and all purchasers at such sale shall be entitled to the rights of stockholders.

SECT. 17.—The stockholders of all corporations under the Act shall be individually liable for all labour performed for such corporation, which liability may be enforced against any stockholder by an action founded on this statute, at any time after execution shall have been returned not satisfied against the company: provided always, that if any stockholder be compelled by any such action to pay the debts of any creditor, or any part thereof, he may sue his co-shareholders, jointly or severally, for the rateable amount due from each person or persons sued.

SECT. 18.—Each corporation for mining purposes shall annually, in July, make a report, which shall state the amount of copper, iron, or other mineral, which such company may have mined within the year; which report shall be signed by the president and the majority of directors, verified by the oath of the secretary or other officer making same, and be filed with the county clerk of the county in which the business is carried on, and a duplicate thereof in the office of the Auditor-General.

SECT. 19.—Every corporation under the Act for carrying on manufacturing business shall annually, in July, make a report, which shall state the amount of capital paid up, and the amount borrowed by such company, and remaining unpaid in whole or part; which report shall be signed, verified, and filed, as in Sect. 18.

SECT. 20.—All mining corporations shall pay into the State Treasury specific taxes, as follows:—For every ton of copper or mineral obtained, 31; of iron, 10 c.; and of coal, ½ c. per ton. The taxes to be paid annually, in July, at the office of the State Treasurer, or at such place in Detroit as he may designate; and the same shall be in lieu of all State taxes to be paid by such corporations: provided, nothing herein shall exempt from state taxation any property of said corporation not invested in said mining or manufacturing business contemplated in this Act.

SECT. 21.—All corporations for manufacturing purposes shall pay to the State a specific tax of half of 1 per cent. on their paid-up capital, and also on money borrowed, which shall, for this purpose, be deemed capital stock. Said tax to be paid, Sept. 1, at the office of the State Treasurer, or at such place in Detroit as he may designate; and the same shall be in lieu of all State taxes from said corporation.

SECT. 22.—Service of all legal process against the corporation may be made on the president, secretary, or agent, or if neither of them can be found in the county in which, by their articles of association, they are to do their business, then such service may be made by posting a true copy thereof on some conspicuous place at the business office of the company in said county.

SECT. 23.—If the directors of any such company shall intentionally neglect or refuse to comply with the Act, and to perform the duties required of them by Sects. 3, 5, 18, and 19 of this Act, they shall be jointly and severally liable for all debts contracted for the corporation during such neglect or refusal, and such of them as were present and acting as such directors at any time during such neglect or refusal shall be guilty of misdemeanour, and may on conviction thereof be fined not more than $5000, or imprisoned for a term not exceeding two years, or both, in the discretion of the court.

SECT. 24.—If any corporation under this Act wilfully violate its provisions, and thereby become insolvent, the directors ordering and assenting to such violation shall jointly and severally be liable for all debts contracted after such violation.

SECT. 25.—The Legislature may at any time, for just cause, rescind the powers of any corporation under this Act, and prescribe means for the settlement of its affairs; and may repeal, alter, or amend this Act.

SECT. 26.—This Act shall be subject to the provisions of chapter 55, title 10 of the revised statutes of 1846, so far as applicable to companies under this act.

SECT. 27.—This Act shall take effect immediately.

The sections of the tenth title of chapter 55 of the revised statutes of Michigan, 1846, relating to the general mining law, are—

SECT. 1.—All corporations shall be capable to sue and be sued, appear, prosecute,

and defend all actions to final judgment and execution; have a common seal; elect officers, and fix compensation, duties, and obligations; make by-laws consistent with the laws of the State for their government and the management of their property.

SECT. 2.—All corporations may by their by-laws, when no other provision is specially made, determine the manner of calling and conducting meetings, the number of members to constitute a quorum, the number of shares entitling members to one or more votes, the mode of voting by proxy, the mode of selling shares for non-payment of assessment, the tenure for office of the several officers, and may prescribe suitable penalties for the violation of their by-laws, not exceeding in any one case, $20; but no such by-laws shall be repugnant to the charter of the corporation.

SECT. 7.—Every such corporation may hold land to an amount authorised by law, and convey same; and whenever the capital stock is divided into shares, and certificates issued, such shares may be transferred by endorsement and delivery of the certificates, but such transfer shall not be valid, except between the parties, until the same shall have been entered on the books of the company, so as to show names of parties by and to whom transferred, number and designation of the shares, and date of transfer.

Meetings of Public Companies.

COPIAPO MINING COMPANY.

The half-yearly meeting of shareholders was held at the offices, New Broad-street, on Tuesday, Mr. J. LABOUCHERE in the chair.

After the usual preliminary proceedings, Mr. E. J. COLE (the secretary) read the following report:—

In submitting the audited accounts to this meeting, the directors regret that the result does not exhibit a sufficient profit to admit of a further dividend being declared this year, but the directors will endeavour to explain the causes which have operated against a more favourable result being obtained: and as regards the future, they trust the shareholders will consider that the measures to be proposed by the board are likely to give an improved and permanent value to the property.

The shareholders are aware that the operations of the company have of late years been extended to silver mining, the result of which, with the exception of one or two instances, has been attended with considerable loss. Upon the recommendation of Senor Narango, the directors have abandoned these unproductive mines as far as the company's interest is concerned, it being quite evident that so long as the expenditure continued thereon much of the profit obtained from other sources would be absorbed, and the prospect of satisfactory dividends being declared continue very uncertain.

The only silver mines in which the company now retain an interest are the Al Fin Hallada and the Republicana. In regard to the former, the failure of the rich bunch of ore, from which such brilliant results were recently obtained, has prevented any remittances coming home; but although the mine of late has barely covered its expenses, the indications are considered highly favourable, and the directors hope ere long to be able to communicate the recurrence of a new discovery of mineral. The Republicana Mine also shows good indications, and is productive, but the yield is insufficient to meet the expenses at the present time. The monthly produce of the Checo Copper Mine during the past year has varied considerably. In Oct., Nov., and Dec., 1855, a large portion consisted of very rich mineral, but in the first six months of this year the quality of the ore very much deteriorated, and left but a small profit on the operations. Recent reports state that the mine is again becoming more productive, and that the prospects are highly encouraging, whilst the returns for July, August, and September last, show a large increase.

In relation to the proposed smelting operations, the directors regret to say that the land upon which the works were to be erected has been the subject of a law suit, the issue of which has been unfavourable to Mr. Wheelwright, and he has, consequently, been unable to deliver the company possession of it. In the meantime, the directors have been furnished by the manager with a plan and estimate to carry out the smelting on the company's estate at Malpaso. The amount of capital that would be required to erect the works, and to supply the means of pursuing the operations uninterruptedly and with advantage, is estimated at a larger sum than the directors had felt themselves justified in embarking, without bringing the subject again before the shareholders; and although they are of opinion that by adopting the process of smelting, on a sufficiently large scale, a permanent and satisfactory profit would be derived, they consider it would be unadvisable, in the present financial state of the company, to enter into that business, unless the shareholders agreed to supply the requisite funds to enable the operations to be conducted on the scale proposed. The capital required for outlay, and to be embarked in carrying on the business, would be 25,000*l.*, and the result anticipated therefrom estimated at 8500*l.* per annum.

The directors are ever willing to promote, as far as lies in their power, the welfare of the company, by incurring any moderate amount of risk which the general prospects of the affairs would warrant them in doing, but they do not consider that they would be acting judiciously in taking up a business which would involve a large outlay of capital, were the anticipated result ever so favourable, unless first provided with funds from the shareholders. The smelting project has, therefore, been a matter of deep consideration, inasmuch as the value of the Checo Copper Mine would, in all probability, be materially increased by that project being carried out.

The view the directors have taken upon this question is, that unless the shareholders be inclined to furnish the requisite funds, it would be desirable that a separate company should be formed for smelting, and that the shareholders should be invited to take an interest in it. That the Checo Mine should be leased, with the Malpaso estate, to the proposed company, at such a sum per annum as may be approved by the proprietors, for a term of years, so as to secure a certain amount of profit, the directors having in view the realising a positive minimum annual dividend, which hitherto the shareholders have been unable to obtain. Should this suggestion be approved, and the proposed smelting company be carried out, there will be less disappointment for the future.

To this secure income the shareholders will have in prospect any additional profits from the silver mines in operation; and inasmuch as the Al Fin Hallada, in the short time of two years and a half, left a surplus of upwards of 31,000,000, there is no reason to doubt but that discoveries of importance will yet be made in the future development of that mine, in which the company holds about one-eighth interest.

The next subject upon which the directors have to report is the position and prospects of the landed estates. It was intimated at the last half-yearly meeting, that a railway was proposed to be formed from Pavilion to the mining district of Chanarcillo, and that it would be the means of giving an improved value to the Horneto estate belonging to this company. With that view the directors promoted with others the formation of an association to carry out that important undertaking, and it affords them on this occasion great satisfaction in stating that the whole of the capital required has since been secured, and there is every prospect of the railway being speedily completed, and brought into traffic. In the meantime, an arrangement is contemplated, by which a nett revenue of 830,000, or about 6000*l.* per annum, will be secured for that part of this company's property. The land apportioned by Mr. Wheelwright for the town of Pavilion will be retained, and at a proper time be disposed of in plots for building, from which a considerable sum may hereafter be derived, but, until the railway is carried out, it is desirable not to dispose of this property, as increased value will then be given to it. The other portion of the company's estates present no new feature to record.

By the last mail, the manager advised that the plans so long demanded of the Hornoto estate, with the town of Pavillon, of the Chacra and Malpaso properties, had been forwarded, as well as surface and underground plans of the Checo Mine, but they have not yet come to hand.

The shareholders will observe, by the accounts now on the table, the financial position of the company; and although the directors are not able to declare a second dividend this year, they trust that at the next meeting they will be able to give a favourable statement of their affairs; inasmuch as a valuable cargo, consisting of about 400 tons of good copper ore, will have been despatched in the past month (Nov.), and there is every probability, from the improvement which appears taking place at Checo, of this shipment being followed up by another in the early part of 1857.*

The accounts were then submitted, which showed—

Balance last audit	£610	4	4		
Dividend	5000	0	0		
Over-estimated on cargoes	900	12	9		
Expenditure in Copiapo and England (12 months)	6840	8	0	=£13,351	5 1
Cargo, per *Albert Franklin*	£5281	13	10		
Remittance from Copiapo	3000	0	0		
Estimated value of cargo, per *A. F. Moore*	5000	0	0		
Balance	69	11	3	= 13,351	5 1

The CHAIRMAN stated that, previous to moving the adoption of the report, he must express his regret that the directors did not meet the shareholders with a more favourable report than that which had been just read, but he trusted the next time they met it would be under more auspicious circumstances. There were two causes which had retarded their progress—the one was the deterioration which had taken place in the Checo Mine, together with the low price of copper, and the falling off in the Al Fin Hallada Silver Mine. As soon as their cargoes arrived, they disposed of the ore, and did not speculate on a rise in the price of the metal. From the report, they would perceive that the land at Caldera, which they had conditionally purchased of Mr. Wheelwright, owing to the adverse termination of a lawsuit, had not been handed over to them. The consequence of this was, that, as far as regarded smelting, their operations must be considered in abeyance. From all parties, he had heard that smelting was a profitable operation, and he was confirmed in this opinion by Mr. Huth, and several other gentlemen who had great experience in these matters. One of the companies established abroad had to borrow money at the rate of 12 per cent. per annum, and yet was enabled to make good profits. The railway company was paying a dividend at the rate of 18 per cent. per annum; and as the railroad was further carried out, it would add greatly to the value of their property. If the shareholders did not subscribe the amount of capital required for a smelting-works, he thought it would be prudent that an independent smelting establishment should be formed, the shareholders of the Copiapo Mining Company being invited to join. The pressure in the money market was now subsiding, and he believed that such a company would meet with great favour.

Mr. CURTIS said it was well known that they had large quantities of poor ores accumulating; these could not pay the cost of freight to England, but if reduced to regulus or copper on the spot would return a good profit.

Mr. WHEELWRIGHT thought that, if they did not subscribe the capital, the most prudential course would be to lease the Checo Mine. Some of the landed estates had been purchased at the rate of 25,000, and he certainly would not advise that they should be sold, even if $500,000 was offered for them; the population was increasing, but the prosperity of the inhabitants had been greatly retarded by the high price of provisions; as the railroad, however, progressed, much of the country would be opened up, and a great improvement would generally take place.

The CHAIRMAN stated that at present the profits made on the railways were not so much from passengers as from the carriage of ores and mining materials. In his opinion, he thought that it might be a prudential course to lease the mines, but he could see no reason why the directors and some of the leading men of the Copiapo Mining Company should not come forward and endeavour to form an independent smelting company.

A SHAREHOLDER observed that he had been connected with another company, the Mexican and South American, and there one of their agents had robbed them; the great difficulty in all these cases was to find honest and respectable agents, in whom the directors could confide. At so great a distance, it was very difficult to control their movements; in England, a stricter supervision could be exercised.

The CHAIRMAN stated they had lately seen that even in London, where it was supposed that all caution and superintendence had been used, some of the servants of the companies had robbed their employers to a considerable extent.

Mr. TINLEY said that he must cordially agree with one part of the report of the directors. This was that he felt great disappointment; they were now going on without a dividend. He had watched the reports from the other side, and they were all favourable; but it was the old song of "Hope told a flattering tale." Every week he read the reports of the Copiapo Company in the *Mining Journal*, and in those he saw statements of ores of 30 and 25 per cent., and that they were raising 60 quintals at one time, at another 90 to 100 quintals of ore per fm.; surely, from this there ought to be some good results. That they had not received the plans was very unfortunate; but, however, he supposed it was one of those errors in transmission which were frequently and unavoidably occurring. He had no cause to complain of the former management; he trusted the directors would not relax in their exertions, but would give stringent instructions to their servants on the other side. As soon as the plans arrived in England, he trusted that, if it was not too great an expense, the directors would have them lithographed, so that the shareholders, when they read the reports, would be able to trace the progress of operations on the sectional maps.

The CHAIRMAN observed that they had decided not to work any mine which did not leave a profit.

Mr. TINLEY said, with reference to leasing, he had no objection. They should not retrograde; they had worked through the mud, and were now at the gravel; if Checo had averaged 5000*l.* a year previously, the presumption was that it could do more, and he certainly thought that a larger amount should be required.

THE CHAIRMAN stated that the object of the directors was (under the most adverse circumstances) to endeavour to secure a minimum dividend: they wished to bring their expenses into as small a compass as possible.

Mr. TINLEY complained that they had procrastinated greatly. It had been stated that, with an expenditure of 25,000*l.*, they could obtain by smelting a profit of 8000*l.* He thought that, with a smaller amount, they would be able on a lesser scale to carry on smelting works. Was he to understand that the bricks, materials, &c., which were sent out from England, were now lying idle?—in fact, were they absolutely doing nothing?

Mr. COLE observed that, until something decisive was arrived at by the shareholders, the question of smelting must be considered in abeyance.

Mr. WHEELWRIGHT said, that when Mr. Powditch found they could not get the site at Caldera, he made a calculation as to what would be the expenses at Malpaso, and these he had returned at 25,000*l.*

Mr. NAYLOR stated that Mr. Powditch was a practical man, and he saw no reason to doubt the accuracy of his estimates. The capital was required not only to keep the works going, but likewise to purchase other ores, in order to flux their own. They were all aware of the large profits made by the smelters in England: there were three or four great leviathans who ruled the market at pleasure, and they did not care about sacrificing 100,000*l.*, if they thought it necessary to effect anything for their own interests.

Mr. TINLEY said, he only trusted the directors would not stand still. It was much less difficult to get money at 3½ per cent. than at 7 per cent., and he should wish to see some decision arrived at.

Mr. NAYLOR thought the directors would have been in a false position if they had embarked in smelting to such a large extent as 25,000*l.* without consulting the shareholders. He and his colleagues had paid great attention to the interests of the company, and they should not relax in their exertions.

The CHAIRMAN, in answer to a question from a shareholder, stated that, in another company with which he was connected (the Alten), they had smelted to advantage.

A vote of thanks was given to the Chairman, and the meeting separated.

EAST INDIA COAL COMPANY (LIMITED).

The first annual meeting of the company was held at the offices, Gresham House, on Monday, Sir HERBERT MADDOCK, M.P., in the chair.

Mr. HENRY HAYMEN (the secretary) read the notice convening the meeting, and the following report of the directors':—

The directors, in meeting for the first time their fellow shareholders, have the pleasure of submitting the accounts, prepared to June 30, in India, and November 7, in England, in conformity with the provisions of the deed of settlement, duly certified by the auditors of the company.

The stock of coal in hand, raised by the machinery purchased with the property, together with the quantity sold since the company has been in operation in India (estimated in value at 1500*l.*), is not included in this account.

The directors desire to remind shareholders that the East India Coal Compay was established in the month of December of last year, at a time when speculation was entirely suspended. Notwithstanding this discouraging state of mercantile affairs, the directors, relying solely on the soundness of the undertaking, and the urgent necessity that existed for its establishment, resolved upon bringing it before the public: the result has fully warranted this confidence. Out of the 15,000 shares, forming the capital of the company, 12,764 have been taken up in this country and the Presidencies of India, leaving 2235 to be disposed of whenever the board may consider such a step expedient.

The capital of the company was fixed at 150,000*l.*, of which the sum of 78,952*l.* 10s. has been received up to the date of closing the accounts.

The accounts before you fully disclose the cost of the property, as well as the amount since expended on machinery, &c., necessary for working the several mines on the scale originally contemplated in the prospectus.

Two calls, together amounting to 5*l.* per share, have been made and responded to. The 2236 shares still unaliotted the directors propose to offer to the public. In the event of their being taken up it will not be necessary to make any further call. Failing this, a moderate instalment per share, sufficient to meet current expenditure for the next few months, will be requisite. Enough capital has been subscribed to pay for the lands and machinery. The chief outlay now to be provided for is the cost of 1¼ mile of light and cheap railway required to connect your mines with the East India Railway Company's terminus at Ranegunge. An estimate for this is in course of preparation in India, and may shortly be looked for. In the meanwhile, to place the agents in Calcutta in funds, authority has been sent out enabling them to draw on the directors of the company.

Immediately after the complete registration of the company under the Limited Liability Act of 1855, the directors purchased two steam-engines, of 35 horse-power each, with suitable pumping and winding gear, and despatched them to Calcutta, under charge of Mr. James G. Wilson, an engineer of considerable experience in mining operations. This machinery has safely reached the mines, and by the last accounts from India was in course of speedy erection. The directors hope, in the course of a few months, to raise the full quantity of coal per day mentioned in the prospectus—300 tons. Very ample reports on your property have been sent home by Mr. Wilson, your engineer; they fully corroborate the expectations of your board.

The directors beg to assure shareholders of their continued intention to carry out the strictest economy in the management of the affairs of the company, and have satisfaction in drawing attention to the moderate amount expended in its establishment.

The recent change in the laws, relative to joint-stock companies, has led to your directors having the company registered under the Limited Liability Act of last session.

In conclusion, your directors see no reason to alter the favourable opinion they originally expressed regarding this undertaking; the property has been found to contain all that was promised; the coal already raised has brought the highest price ruling for Bengal coal in the Calcutta market; it has been most favourably reported upon by the local railway authorities and other large consumers, and contracts have been made for considerable quantities to be delivered during the next six months. Under these circumstances, the directors feel justified in anticipating an early return to shareholders upon the capital invested.

A statement of accounts was submitted, from which it appeared the balance at banker's was 458*l.* 2s., and petty cash 5*l.* 12s.=463*l.* 14s.

The CHAIRMAN, in moving the adoption of the report, said it gave the directors great satisfaction in meeting the shareholders upon the present occasion, it being the first annual meeting. In the course of the year they had to contend with a serious rivalry in India, where a company had been established for some years, and had derived large interest on its capital. As this company had sent out more efficient machinery, there was no reason why it should not meet with the same success as the Bengal Coal Company; and through the establishment of railways and factories, the consumption of coal in Calcutta was increasing daily, and he had no doubt would continue. He (the Chairman) was glad to inform them that some of the coals they were raising would vie with some of the best sent from England, and he hoped by the end of next year to announce to them a very respectable dividend. (Cheers.) They had 2236 shares on hand, which they intended to offer to the public, and if they were taken up there would be no necessity for a call; but, in the event of not succeeding, it would be necessary in a few months to call upon the shareholders for a small contribution. Dr. Stock, a German professor of some eminence, had examined the property, and reported very favourably upon it; and when his report was translated it would be open for the inspection of shareholders.

Mr. SHAW moved the adoption of the report and accounts, which was seconded and carried unanimously.

Mr. BROWN then moved a vote of thanks to the directors, for the satisfactory manner in which the proceedings had been conducted since the establishment of the company. Carried unanimously.

A SHAREHOLDER wished to know whether the cost of raising the coal and sending it to market would be greater than they expected?

The CHAIRMAN replied that they were working two seams, and no difficulty had been met greater than was spoken of when the company was formed. The labour had been very trifling in clearing out the water from the mines. It was possible that in consequence of the increased supply of coals brought into Calcutta by means of the company, the existing market price might not be fully maintained, but that was a mere speculation, as the increased consumption to which he had before alluded might keep up the price.

A SHAREHOLDER said it had been reported that some of the property of this company belonged to the Bengal Coal Company. On making enquiry of Mr. Haymen (the secretary) he found there was no truth in that report; but it would be satisfactory to the shareholders to have a public contradiction from the Chairman.

The CHAIRMAN said he was aware that disparaging statements had been circulated, but they held their property by the best of titles. They were in undisputed possession of mines, and had sold 1500*l.* worth of coal, and entered into contracts for the supply of coals for the next six months. Under these circumstances, no proprietor could entertain any reasonable doubt that those statements were unfounded.

A resolution was then passed that the proceedings be advertised in the *Mining Journal*, *Times*, and *Daily News*.

Messrs. James Hume and W. P. Haymen were re-elected directors; and Messrs. J. Noble and H. C. Read, auditors; and the sum of 20*l.* voted to each of the auditors for their services.—A cordial vote of thanks to the Chairman terminated the proceedings.

ROTATORY STEAM-ENGINES.—Mr. C. J. Graftiaux, Molenbeck, Brussels, proposes, in constructing a rotatory steam-engine, to depart from the usual mode of feeding the cylinder, and to pass the steam through a pipe by means of a stopcock; this pipe will, at its extremity, be furnished with a stuffing-box, thence the steam will be passed through a conductor to a drum, from thence, by a small opening, to the cylinder, and force the piston past a slide which is to be simultaneously withdrawn by means of an eccentric. The steam having produced the desired effect, will pass on into another compartment of the drum, and from thence be discharged. The whole system may be reversed for rotation by using means cited in an opposite sense—that is, by making the steam enter at the exit provided for it.

DIMENSIONS OF THE AMERICAN LAKES.—The latest measurements of the fresh water seas of America are—The greatest length of Lake Superior is 335 miles; the greatest breadth is 160 miles; mean depth, 988 feet; elevation, 627 feet; area, 32,000 square miles. The greatest length of Lake Michigan is 360 miles; its greatest breadth 108 miles; mean depth, 900 feet; elevation, 687 feet; area, 20,000 square miles. The greatest length of Lake Huron is 200 miles; its greatest breadth, 160 miles; mean depth, 300 feet; elevation, 574 feet; area, 20,000 square miles. The greatest length of Lake Erie is 250 miles; its greatest breadth, 80 miles; mean depth, 200 feet; elevation, 555 feet; area, 6000 square miles. The greatest length of Lake Ontario is 180 miles; its greatest breadth, 65 miles; mean depth, 500 feet; elevation, 262 feet; area, 6000 square miles. The total length of all five is 1534 miles, covering an area altogether of upwards of 90,000 square miles.

TREBURGETT CROWAN CONSOLIDATED COPPER MINING COMPANY (LIMITED BY ACT OF PARLIAMENT).
SITUATE IN THE PARISH OF CROWAN, THE BEST MINING DISTRICT IN CORNWALL.

Capital £50,000, in 5000 shares of £10 each.—Deposit £5 per share.

OFFICES,—No. 9, AUSTINFRIARS, LONDON.

Applications are yet required for the 1500 shares unsold. 135

Prospectuses may be obtained at the offices of the company; or of the broker, PETER WATSON, Esq., 57, Threadneedle-street.

J. G. CAMBELL, Sec.

FOX TOR ALVENNY TIN AND COPPER MINING COMPANY (LIMITED, under the Act of 1856).

Capital £50,000, in 5000 shares of £10 each. Deposit £5 per share. £1 per share to be paid on application. 136

Applications for the 2500 shares unsold may be made in the printed form, and addressed to the offices of the company, 9, Austinfriars, where prospectuses can be obtained; or of PETER WATSON, Esq., 57, Threadneedle-street.

J. G. CAMBELL, Sec.

WHEAL LOPES COPPER MINE.
SITUATED IN THE PARISH OF BICKLEIGH, PLYMOUTH, DEVON.

Capital £6000, in 6000 shares of £1 each.

16s. paid up, the remaining 4s. only to be called for by vote at a General Meeting.

COMMITTEE OF MANAGEMENT.—A Committee of Management to be elected by the adventurers at a General Meeting.

MANAGING DIRECTOR (pro tem.)—W. H. Mortimer, Esq., F.G.S.

BANKERS—The Devon and Cornwall Bank, Plymouth.

OFFICES,—3, OLD BROAD STREET, CITY.

Wheal Lopes is a copper and zinc mine, on the property of Sir Massey Lopes, Bart., at Bickleigh, about six miles from Plymouth. It was formerly worked by the Plymouth and Dartmoor Mining Company, and it was the last mine abandoned by that company when their funds were exhausted in other undertakings.

During the period this mine was worked, they raised and sold large quantities of grey, and yellow copper ore. They also obtained a considerable amount of copper of high produce, by precipitation from the strongly mineralised warm water in the mine.

Very extensive deposits of blende (zinc) were also laid open, but not worked, as that mineral had not, as it now has, a marketable value, and a ready sale.

The concurrent testimony of all persons spoken to on the subject, who have worked on the mine, tends to prove that there now exist large deposits of copper ore laid open in the old backs and winzes, which, at the present average standard (£130), will work to a good profit, but which were valueless at the time of the former workings, when the standard rarely exceeded £90.

The mine can be worked at a very moderate cost. No steam power will be required. The river Plym furnishes a powerful stream of water, sufficient to turn all the machinery requisite for pumping, hauling, and dressing the ore.

Neither will there be any delay occasioned in sinking shafts or driving levels. The main engine shaft is sunk to the 62 fm. level, and an eastern one to the 82 fm. level. Levels and winzes have been driven and sunk at different depths, so that immediate returns of copper and blende may be expected as soon as the mine is in fork.

The sett was applied for, and obtained in January last, by Capt. James Phillips, of the Bedford United Mines, whose long experience and practical knowledge will be the best guarantee for its value; and who, with others paid a large premium to the lord for the grant.

The mine has since been re-opened, and to prevent delay, all the necessary machinery and plant to work the mine has been erected, and is now in operation.

The lessees and their representatives have relinquished the lease, and have agreed to pay for all the works already completed, and those still to be executed, according to specification:—also, to hand over all the machinery, plant, materials, &c., now on the mine, or contracted for as per schedule:—also, to pay all the labour costs, and agencies, to the end of November; and to hand over any balance that may remain, and computed as per estimate to be furnished—on consideration of receiving the amount produced by the above instalment of 16s. per share.

The reserve fund of 4s. per share, or £1200, will only be called up, if required, by vote at a general meeting.

A portion of the shares may be obtained at par by any respectable party wishing to join the adventure.

Applications for shares must state the name and address, with a reference, and be accompanied by a remittance of 5s. per share, and may be made by letter addressed to the managing director; or, personally, to Mr. Cardozo, at the offices, No. 3 Old Broad-street, City, where the schedule, specification, and estimate: with plans reports, and specimens taken from the adit level, or found in the burrows, may be inspected, and further information obtained.

The shares will be allotted on the 18th December. Should the applications exceed the number, they will be allotted *pro rata*.—Nov. 25, 1856. 137

REPORTS.

Bedford United Mines, April 14, 1856.—SIR: I beg to furnish you with the particulars of the sett referred to. It is named Wheal Lopes, after Sir Massey Lopes, Bart., from whom the grant is obtained for 21 years from last January, at one-fifteenth dues: and embraces a large extent of ground, both on the course of the lodes, and also from north to south. It is an old mine, worked about 12 years since, chiefly by Plymouth adventurers. The situation of the mine is about six miles from Plymouth, close to Bickleigh Vale, in a mineralized killas or clay-slate, bordering on the Dartmoor granite. There are five lodes in the sett, which are traversed by several cross-courses, and in the eastern part an elvan course crosses the lode at an oblique angle: these are favourable features for mineral. A large amount of capital has been expended on the mine, in sinking, driving, &c., but more especially in the eastern part; in fact, the greatest part of the money was spent in that direction, in sinking, to get through the elvan course, which, however, was not accomplished. In the western part the deepest point of operations to any extent has been fourteen fathoms below adit, and from which hundreds of tons of copper ore have been sold: and in looking at the lode in the adit level, which is very large, and producing stones of ore almost throughout the drivage, I fully believe that a deeper trial will make this a very productive concern. The lode in the adit level end is somewhat smaller, than for some distance behind it, being now about 2 ft. wide, composed of gossan, capel, spar, and stones of copper ore; and about 20 fms. west of this, there is a very good gossan back to be seen; and as there is rising ground for 400 fms. west of the present end, the driving of this level would be a good speculation of itself alone. At the foot of the western hill, there is an excellent engine-shaft down to the 62 fm. level, and the lode would come into the shaft about 35 fms. deeper. Up to the moment of stopping, the lode in the 62 west (which is only driven a very short distance) produced excellent stones of ore,* and the general impression was that they were on the eve of discovering a long run of ore ground, especially looking at the returns made further west at the shallower points. The water in the mine is very warm, and so strongly impregnated with copper, that many tons have been returned by precipitation.† From the 30 to the 50 fm. levels, there are scores of tons of blende laid open by levels and winzes, &c., available for cheap and advantageous stoping away, if the present price of blende continues; and this blende deposit also contains very fine stones of copper ore. During the last workings there was no sale for this mineral, and the standard of copper was very low. Had not this been the case, I have a strong impression that Wheal Lopes would have been working to this day, and in a flourishing condition. The gossan on this lode is as fresh and as good at the 60 and 70 as at surface, and this speaks well as a strong and favourable character for mineral. The burrows at surface are stamped with the true character of a strong and very promising mine, and I know no place in the district which looks more inviting than this. I will now give you a few details as to the advantages for re-working this mine:—

1. CHEAP CARRIAGE. The Plymouth and Dartmoor Railway passes through the sett, and the Plymouth and Tavistock Railway will have a station at Bickleigh, close to it.

2. WATER POWER. A large and powerful stream of water is available for all the purposes of the mine, and the water-course which is brought at a distance of 4 miles, is included in the grant. As a proof of the high opinion entertained of this mine, the water-course had to be cut through solid rock by tunnelling, for nearly a quarter of a mile, and it must have cost to bring this stream of water home to the mine, nearly £2000.

3. A first-rate ENGINE SHAFT, down to the 62 fm. level, fit for machinery at once.

4. Wheal-pits excavated only requiring trifling repairs,‡ with lobby adits, &c., for taking off all surface water.

It may be presumed that this mine was abandoned from poverty—granted that it was so—how many mines about here have been abandoned several times for the same reason, and are now good mines? Bedford United, Devon Consols, Wheal Friendship, have all been formerly stopped from the same cause, and that, in my opinion, does not at all act prejudicially against Wheal Lopes; on the contrary, I believe that a trial of the western ground will shew that only more capital was required by the last party to have made it a good mine. However, all their outlay is in favour of a new company. Taking everything into consideration, the very promising character of the lode, the excellent advantages of water power for machinery, the great amount of work already accomplished in favour of fresh operations, I shall strongly recommend it as a fair and legitimate field for the employment of capital thereon. As I am one of the Lessees, I do not like to give too high a colour to this report, but there the sett is open to the inspection of any mining men. JAMES PHILLIPS.

Objections were taken to the locality, which led to the following letter:—

Bedford United Mines, April 23.—SIR,—I should have replied to your letter sooner, had not your observations and questions required careful consideration. In the first place you appear to think that the lodes in Sir Massey's property make shallow bunches only, and do not hold in depth. This probably alludes to Lady Bertha and the Virtuous Lady Mines. The former it is rather premature to talk about, the workings as yet being of a very limited character, and the latter was not a regular lode, but consisted of flat beds, in which large quantities of ore were found, and most probably caused by three or four lodes meeting at this certain point; and these lodes have had no trial either east or west of it. There are only two other mines on Sir Massey's property; these are, the Old Wheal Franco, which was worked considerably below the 100 fm. level, and returned large quantities of ore. The other mine alluded to is the present Wheal Franco, which, although not profitable to any extent, has, nevertheless, returned large quantities of ore, and is looking better in the 80 than in the upper levels. Thirty years' experience has also taught me, that because a shallow bunch of ore is met with, and becomes exhausted, that is no criterion why deeper bunches should not be found. I well recollect Wheal Friendship making shallow, and the notion was that it was too far north, and too near the granite to make a deep mine; but after twice stopping it was proved that the same causes which produced these shallow deposits had evidently a great influence in making it a deep and lasting mine. The same thing occurs here at Bedford, and in fact almost every mine around here, and in Cornwall also, and you may rely on it, this is an old notion respecting mineral deposits which, like many others, ought to be thrown aside. There is no doubt whatever in my mind, that as soon as the water is in fork, there is to be obtained at the present standard a tolerable quantity of mineral produce from the old backs, to assist in carrying out the mine. The driving of the 62 west will go back under a fine rising hill, in which the lode in the adit level shows excellent indications, producing good stones of ore. Since I wrote last, we have discovered another lode to the south of the main one, which is large, and of a very promising character, and according to its direction will fall in with the main lode at about 60 fms. west of the engine-shaft. We are shoding to cut another south lode, which we expect to see shortly. I think, as I said before, it is a sett well worthy of the employment of capital. I know of none possessing better advantages, or one to which I would more willingly invite inquiry and inspection. JAMES PHILLIPS.

* A stone weighing 7lbs., and found in the burrows, gave by assay, a produce of 22¼.

† This statement has been in a measure verified; an iron rod was lowered 15 fms. into the water, and after immersion for one hour, was found to be coated with copper.

‡ The wheel pit required to be pulled down and rebuilt, and the ground excavated for a larger wheel.

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London: Published at the *Mining Journal* office, 26, Fleet-street, London. 143

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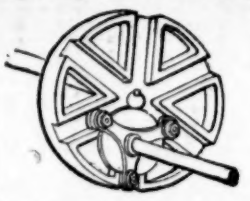

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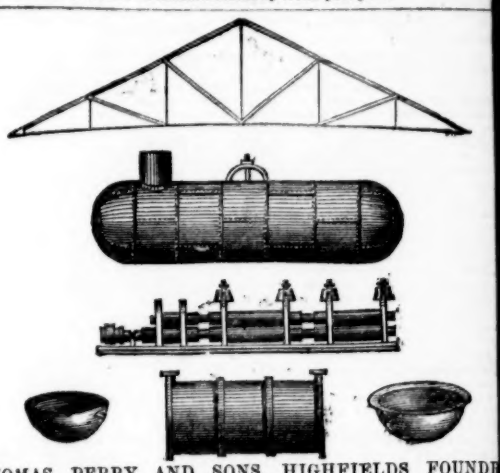

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